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# West Europe Report

SCIENCE AND TECHNOLOGY

No. 118



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## CONTENTS

## BIOTECHNOLOGY

First 'Microbe Bank' Established in FRG  
(SCIENZA & VITA NUOVA, Jun 82) ..... 1

## Briefs

Fuel Alcohol From Straw, Wood ..... 2

## ELECTRONICS

Government Funding for Electronics Industry Discussed  
(LE MONDE, 30 Jul 82) ..... 3

## INDUSTRIAL TECHNOLOGY

FRG Report Foresees Nine Thousand Assembly Robots by 1990  
(FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 7 Jun 82) ..... 6

## SCIENCE POLICY

European Parliament Presents Report on Research Costs  
(FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 28 May 82) ..... 8

France's Industrial Research Effort Analyzed  
(LE NOUVEL ECONOMIST, 5 Jul 82) ..... 10

Chevenement Appointment a Signal,  
by Sophie Seroussi  
Industry Minister Interviewed,  
Jean-Pierre Chevenement Interview

## Briefs

Association for Scientific Exchange ..... 22

TRANSPORTATION

FRG Develops Sail-Powered Cargo Ship for Indonesia (DER SPIEGEL, 26 Jul 82) .....	23
Peugeot, Renault Continue Automation in Manufacturing (Alain Perez; INDUSTRIES & TECHNIQUES, 10 Jun 82) .....	28
NC Processing Center for Sandwich-Construction Airbus Parts (MBB AKTUELL, May 82) .....	30
<b>Briefs</b>	
Transrapid Suspension Device Tested	32

BIOTECHNOLOGY

FIRST 'MICROBE BANK' ESTABLISHED IN FRG

Milan SCIENZA & VITA NUOVA in Italian Jun 82 pp 14-15

[Article by M.J.: "Microbes in a Strongbox"]

[Text] The first microbe bank has been born in the FRG. In it are kept, under maximum security, the bacteria *Escherichia coli*, a few *Pseudomonas*, and various yeasts. It was not natural scientists fearful about the specimens in their studies who made the original deposits at the "tellers' windows"; it was rather the managers of chemical or pharmaceutical firms, who put into the safe-deposit boxes those microorganisms that have been manipulated, if not completely reinvented, in their laboratories. And they are certainly right to do so, because the microbes involved are worth a great deal.

As is known, the "creation" of bacteria with properties not provided by nature but extremely useful, through the artificial introduction of one or more fragments of genetic material by genetic-engineering techniques, is now almost routine. Among the first inventions, for example, is that of the bacterium which, "instructed" by a human gene, produces the best insulin for diabetics in practically unlimited quantities and at incomparably low costs. It is also possible in this way to manufacture other hormones, ferments and, in short, proteins of the most diverse types.

The institute which, just a few months ago, obtained authorization, in accordance with the international conventions, to conserve microbe cultures is located at Gottingen, in Lower Saxony. There are two reasons why the industries are concerned to keep their creatures "under lock and key." The main reason is to keep control over the patents (which have been granted for a few years now, to protect microorganisms of industrial interest).

Secondly, there is the risk that during the prolonged cultivation of the bacteria, mutations that alter their characteristics might appear. Hence the utility of being able to tap the original stock again.

Apart from the traditional breeding under controlled conditions, there are two conservation techniques: freezing in liquid nitrogen, and a lyophilization process entirely similar to the one used for food; and at the right moment, the precious microbes can thus be "called back to life." At present, about 4,000 different species are deposited at Gottingen.

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CSO: 3102/362

BIOTECHNOLOGY

BRIEFS

FUEL ALCOHOL FROM STRAW, WOOD—After many years of development work the Munich engineering company Cell Design GmbH, Advisory Engineers VBI started to use a demonstration set-up for the production of fuel alcohol from left over and by-products of biomass. In the "biol" set-up, waste materials like straw, reed, waste paper, or waste wood are converted, by the continuous "biol-process," to sugars which, through fermentation, yield the fuel alcohol, ethanol. The special characteristic of this method, according to information from the company, is that after the process, enough lignin residue remains from the biomass to burn to produce steam and power for the process. Based on the first experimental results and temporary calculations of economy, the Federal Ministry for Research and Technology is reported to have given substantial financial support to Cell Design in Munich for an extensive study of the project and process. Through experiments with grain straw and with eucalyptus wood from Brazil, as well as by planning and calculating an appropriate large-scale plant, it should be determined whether the "biol-process" today allows for an economical production of fuel alcohol to competition with gasoline from petroleum. The result of the study will be presented and published by the end of 1982. According to proposals by Cell Design, the production of furfural and lignin coke should also be examined with partnership companies. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 3 Jun 82 p 7] 9280

CSO: 3102/329

## ELECTRONICS

### GOVERNMENT FUNDING FOR ELECTRONICS INDUSTRY DISCUSSED

Paris LE MONDE in French 30 Jul 82 pp 1,19

[Article by J.-M. Quatrepoint]

[Text] The government has decided to make the development of the electronics industry the industrial priority of the next five years. A five-year investment program of 140 billion francs will be implemented, of which the state would assume responsibility for about 55 billion francs.

After the nuclear program under the Gaullist government, and after the telephone under Giscard d'Estaing, the development of the electronics industry will be the grand industrial design of Mr Mitterrand's seven years.

The government and enterprises will have to boost their financing effort by about 50 percent in constant francs for the 1982-1983 period in order to bring to 140 billion francs the total investment of the electronics industry for the next five years.

This is an effort which will make it possible to create 80,000 jobs in a sector that currently has 320,000, and to recover the equilibrium of its trade balance, which has an annoying tendency to degrade.

These are also goals that could apply to many other industrial activities. Why then give electronics the highest priority? "This is not a case like any other," explains the minister of research and industry. "Through the electronics industry, it is the future of our industry as a whole that is brought into play."

A sector of the future, with a rapidly expanding market, electronics is infiltrating all other human activities, and in fact determines the modernization of the industry as a whole (without electronics, no robotics or productics), not to mention its influence on the production of cultural products.

"We have no choice," the minister goes on, "because the rate of technical progress is imposed upon us by international competition." As the token of a "certain industrial determination," the electronics industry plan must thus allow the French industry to maintain contact with its Japanese and American competitors.

This awareness of electronics' strategic nature, which was largely awakened by the work of the electronics industry task force, has culminated in an action program spread over several years, exhibiting four facets: research, industry, utilization, and training. Three of these aspects were presented Wednesday at the Council of Ministers.

In research, and as predicted (LE MONDE of 29 July), nine large national projects combining industrialists and public laboratories, were retained from the 14 proposed by the electronics industry task force.

Actions will be started to disseminate electronic applications in industry and the business sector (electronic money for instance), and to provide managements and the public sector with "quantitative and qualitative objectives for using information technology."

The Ministry of Research and Industry feels that "training is one of the major bottlenecks of the industry."

The annual shortage is estimated at 1100 engineers and 3000 senior technicians. A plan will be formulated to close the gap by training more than 4000 people in three years.

Various other measures, among which the creation of national higher education institutes, should produce an annual influx of an additional 4000 graduates.

For completeness, this program still lacks its industrial facet and its financing plan. The latter is actually more or less determined, at least in its major features. But a discussion arose in recent days within the government, about the political advisability of making these figures public.

Would it not have shocked a portion of the population to read about state aid for the electronics industry at the very moment when austerity is the order of the day? Moreover, the Ministry of the Economy and the budget department are shuddering a little at the bill and resisting obligations spread out over several years. The chief executive ultimately settled the matter: he asked that the figure of 140 billion francs be announced, so as to emphasize the magnitude of the program.

#### Financing Plan

The 140 billion include the financing by the state, private and public enterprises, or subsidiaries of foreign groups, for the 1982-1986 period. If the curve had maintained its present slope, the investments would have amounted to only 90 billion. This means that an additional 50 billion francs are being envisaged.

The government would normally have contributed 25 billion francs for financing; as it is, its participation would come to 55 billion. The state will therefore have to find an additional 5 billion (constant) francs each year for the electronics industry.

Telecommunications and professional electronics already have the highest investment budgets with financing from the armed forces and PTT (Mail, Telegraph, and Telephone). It is expected that this investment effort will simply be maintained for the next five years, which will still represent 80 billion francs out of the 140 billion.

The distribution of the remaining 60 billion francs among the nine sub-sectors of the industry has not been finalized. However, orders of magnitude can already be given.

Components, 10 billion francs; consumer electronics, 7 billion; informatics, 13 billion; office automation (excluding CII-HB), 1.7 billion; software and informatics services, 4.5 billion; space industry, 15 billion; industrial informatics and automation, 3.2 billion; scientific instrumentation, 2 billion; and medical electronics, 3 billion.

If these investments are compared to current ones, or to the ones that were normally expected, we note that the additional effort will primarily benefit informatics, components, and consumer electronics.

The industrial aspect still remains to be decided; an essential, and far from delicate task. We are told that by September, when everyone returns from vacation, it will be an accomplished fact. Discussions with the industrialists are continuing, and boundary problems among the "gang of four" nationalized companies--CGE, Thomson, Matra, and CII-Honeywell-Bull--who provide 50 percent of the industry's production, are still far from being solved.

In Mr Chevenement's conception, this industrial facet does not have to be limited to the public sector and to France. PMI (small and medium-sized enterprises), the private sector, and even French subsidiaries of foreign groups, must fully participate in the development of the electronics industry, and the state will reach "conventions" with enterprises that want them.

And finally, the government insists on the necessary international cooperation, with priority for the European side. "To refuse a slot policy for the electronics industry does not imply that France will do everything by itself, because in some cases the tasks can be divided within Europe." These are words which echo the "European overtures" of Max Grundig and of the new Philips head executive, Mr Deeker. So far, these inclinations toward cooperation remain simply words. Will they translate into concrete actions?

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## INDUSTRIAL TECHNOLOGY

### FRG REPORT FORESEES NINE THOUSAND ASSEMBLY ROBOTS BY 1990

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
7 Jun 82 p 7

[Text] Frankfurt, 6 June--By the year 1990 approximately 9,000 industrial robots will assemble products in the assembly areas of German companies, most of which today are still produced by man. That is the result of a study of the Frankfurt Marketing Research Institute Gewiplan on the field "flexible automatic assembly systems." This is not a matter of the already widespread kind of robot used mainly in the automobile industry to weld, lacquer and move parts, but a matter of systems which automatically accomplish the changing-operations in the assembly of parts that have to be sorted differently.

The area of assembly still employing some 400,000 people today, has to be regarded as one of the greatest automation potentials for production technology. According to calculations of the institute, by 1990 approximately half of the assembly tasks in all branches of German industry will be automated by the use of robots and automation systems. Earlier studies on the use of industrial robots came to the conclusion that for each new job at least two would be eliminated. However, reliable findings are not yet available.

At present, according to estimations by Gewiplan, a total of 1,500-1,700 industrial robots are in operation in the FRG. By 1990 the number is expected to increase twentyfold and the greatest part of the increase will be in the assembly area. For the companies which plan to operate in this market it is, however, according to the opinion of marketing researchers, most important that complete systematic solutions be offered to assembly plants with numerous single stations of highly differential constructions. The 9,000 assembly robots by the end of this decade are, according to the prognosis, only part of approximately 8,000 flexible automatic assembly systems which, all in all, will include some 200,000 assembly stations. The size of the German market for the flexible automatic assembly systems is estimated by Gewiplan to be about DM 30 billion for the period of the next 8 or 9 years.

The obstacles to the growth of automation and robots in the area of assembly are, according to the findings of marketing researchers, not only technical problems like the production of appropriate sensing devices, but missing information on the part of the potential user, the "anti-automation" assembly

organization, and the construction as well as the complexity of some products. According to the estimation of Gewiplan, the assembly systems will most probably succeed in the automobile industry. Automation is expected to be most difficult in machine tool construction because the highest demands are placed on the flexibility of production and the individuality of the products.

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## SCIENCE POLICY

### EUROPEAN PARLIAMENT PRESENTS REPORT ON RESEARCH COSTS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
28 May 82 p 7

[Text] Frankfurt, 27 May -- The Committee for Energy and Research of the European Parliament has presented a report which deals with the common research policies (3/29/1982 PE 74527). Comparing the European Community with the United States and Japan, it turns out that the part of the entire civil research expenses of the gross national product amounts to 1.7 percent in the European Community, 1.7 percent in the United States, and 2.0 percent in Japan. Thus Japan spends the most, in comparison, for civil research and development. The state research expenses of the European Community for 1980 are shown by the following table (in millions of ECU):

Country	Total	Civil Amount	Civil (In Percent)
FRG	6,308	5,572	88.3
France	4,542	2,938	64.7
Italy	923	895	97.0
Netherlands	1,049	1,017	97.0
Belgium	469	467	100.
Great Britain	3,135	1,459	46.6
Ireland	57	57	100.
Denmark	243	242	100.
Europe	16,726	12,646	75.6
EG-Commission	238	238	100.

It turns out that in the European Community only 75 percent of the state research expenses are set aside for civil research and development. This is

basically due to the behavior of Great Britain and France, where military research and development still play an important role. Within the European Community three countries, namely the FRG, France, and Great Britain combine 80 percent of the research expenses of the state. Also interesting is a comparison of energy research with overall research. Here it turns out that within the European Community the state expenses for energy research amount to around 14 percent in comparison with the funds for civil and other research and around 23 percent in the United States. But the energy research is proportionally supported more in the United States than in the European Community. Nuclear energy research still dominates with 75 percent of all state energy research funds.

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SCIENCE POLICY

FRANCE'S INDUSTRIAL RESEARCH EFFORT ANALYZED

Chevenement Appointment a Signal

Paris LE NOUVEL ECONOMIST in French 5 Jul 82 pp 42-47

[Article by Sophie Seroussi: "Properly Applied Research"]

[Text] M Jean-Pierre Chevénement's appointment as minister for industry is not merely a political event. It may well signal a turnaround in the government's industrial strategy.

Research has won its all-out push to get the upper hand over industry. Did M Jean-Pierre Chevénement really hope for such total victory quite so soon? To be, at 43, the boss of his country's research and industry, bracketed together into a super-ministry strong enough to slip off the old Finance Ministry leash? A 1963 graduate of the prestigious Hautes Ecoles Nationales, an activist in the French section of the Workers Internationale (SFI0) in 1964, founding father of the Center for [Socialist] Studies, Research, and Education (CERES) in 1966, the man who negotiated the Joint Program in 1972, elected to Parliament as deputy for Belfort in 1973, M Chevénement has changed his image since he became Minister of State in 1981. Prior to that time, the doctrinal guru of the PC-PS union made businessmen uneasy. Today, he fascinates them. Can today's minister for industry felicitate himself on the job done by yesterday's minister for technology?

An ecumenical gathering of the research community last winter in Paris, an ambitious legislative package for research this summer, speeches from the president, from ministers, from experts or from employers -- all combined to anoint M Chevénement: the technology offensive is perceived today as the panacea that will cure unemployment, halt the recession, put an end to hunger everywhere in the world, and solve the energy crisis. And yet the unshakable M Jean-Pierre Chevénement goes right on driving home the message: "What we ought to be afraid of isn't talking too much about technology, but not talking enough about it!" He can relax now.

Above and beyond all the words, when it decided to boost domestic research and development spending up to the level of the other industrial powers -- 2.5 percent of the GDP by 1985 -- the government signalled its firm determination to trade talk for action.

For French industry, it was high time. Every year, for every patent application filed by a Frenchman, the British file almost two in their own country, the Germans three, the Americans six, and the Japanese and Russians around fifteen. Along with that comes a corollary: the alarming increase in the number of foreign patents taken out in France, which now account for 75 percent of the total, and sometimes more than that in such key sectors as chemicals, pharmaceuticals, electronics, or computer sciences. Why? Lack of money. In 1981, France devoted only half as much money as Germany to industrial research, and only a quarter as much as Japan. As of now, the money is going to be there. The research orientation and planning bill, which has just passed the Assembly, makes it clear that from now on "industrial research will be vigorously encouraged." A twofold effort is needed. From the state: funding for technological development must increase by 60 percent, as against the 44 percent of previous years. From industry: the volume of research must hit 1.5 percent of GDP by 1985, instead of today's paltry 0.7 to 0.8 percent.

In industrial research, as in any other endeavor, if you set out to succeed it is better to be big, rich, and smart. That means that the nationalized corporations will be right out there on the front line. The grand strategic maneuvers that surrounded the nationalization campaign let that be clearly understood. Thomson, CGE, Rhône-Poulenc... all of them must join in and generate a synergistic effect on other corporations. M Chevènement can play on the biggest keyboard ever entrusted to a single minister in any Western economy. In the course of his passage to Research, he had the chance to try three avenues of intervention in the industrial fabric. He comes back to them today as the minister in charge of giving the key production areas -- the nationalized sector, the innovative PMIs, and the applied research centers -- a shot in the arm.

The channel of choice will be the nationalized corporations. Like his friend Alain Gomez, president and general manager of Thomson, the new Industry Minister may tend to exaggerate a little when he talks about their ability to pull others along in their wake. But what inner resources? Take one example among many: ELF-Aquitaine.

With a research staff of 2,000, four major research centers for chemistry and energy and soon to have a fifth devoted to biotechnologies, plus a 1982 budget of 1.5 billion francs, the National ELF-Aquitaine Corporation is a model of its kind in the area of industrial research. At ELF, research is a total attitude instilled some 20 years ago by its boss, M Bernard Delapalme, 59, a Polytechnique graduate. He is a one-man band. He was the sea-going genius who presided over the cruiser Jeanne d'Arc, who ran the Nuclear Studies Center at Grenoble, who held a chair in electronics -- and all the miscellaneous milestones of his career made him a member of every research commission, council, and mission. The mischievous eye that looks out through those horn-rimmed glasses tells you at once that he is not a man to rest on his laurels. You have only to see him and listen to his feverishly enthusiastic

talk to understand that he applies this perpetually questioning approach at ELF to research. The oil companies are caught in a nasty bind. On the one hand, their raw materials supplies may well become even dicier. On the other, their customers are constantly devising elegant new ways to get along without what they have to sell. Already doomed, sooner or later, their business is crumbling away. Something like a grocer who has no more stock and no more customers, they must reconvert or perish.

Ever the realist, M Delapalme explains: "Research simply doesn't exist unless it is pulled into being by the demands of the market. Anyone who directs research for a big group must constantly make sure that he is accessible to what is going on inside his own shop as well as outside." And, to maintain that precarious balance, he has a secret that he calls the "3 Ss." Specific, strategic, and savage [wild], research at ELF operates on three levels:

Specifically, it responds to the group's immediate needs in the areas of exploration, refining, and industrial development.

Strategically, it forecasts future requirements. Ten years ago, when SNEA's board decided to invest in marine and under-water exploration technologies, that was a sound strategic choice. Today 40 percent of its production comes from the sea, while the worldwide average is 20 percent.

In the long run, ELF devises scenarios which, once tested, can become strategic choices. This wildcat research gets all of 10 percent of the research budget, with the rest evenly distributed between short- and medium-term research. Despite its small budget, wildcat research is far from being underestimated. Its driving force, M Charles Vernet, 58, is an old hand at research who lived through the glory days -- now gone forever -- of oil protein research at British Petroleum. "This antistucture we have leaves the door wide open to creativity," says M Vernet. "All it has actually done is to legitimise all the free-lance research that has always gone on in every industrial research laboratory in the world. It is a research man's right, and his duty, to ask questions outside the confines of any pre-established program. Our job is to go fishing for ideas." Wondering what made the Nile mud so fertile led to work on plant nitrogen fixing and to new markets in fertilizers. Wondering about ways to preserve the ancient monuments of Babylon led to new hardening and consolidation products for the construction market... and to a privileged relationship with the Iraqi authorities -- something that, to an oilman, is not to be sneezed at. Such techniques as slant drilling and enhanced oil recovery, the early interest in biotechnologies and new sources of energy -- all these, at ELF-Aquitaine, came out of the crucible of wildcat research.

In the other major conglomerates, the approach may not always be quite so original as that. Nevertheless, all of them are investing

considerable sums in research and development. Thomson has one of France's top-flight strike forces in research, with a budget of 4 billion francs and 15,000 research people on its payroll. Renault, PUK, Saint-Gobain, Aérospatiale, etc. put 2 to 4 percent of their volume of business into research.

A dynamic center for technological development must, above all, benefit the others. How? With men, with structures, or with money.

As for the men, M Delapalme preaches the swarming theory. Utterly convinced of its soundness, he says: "The Anglo-Saxons have more and more companies which, like ICI and General Electric, let their employee-entrepreneurs go out on their own, and help them set up their own businesses. If this were tried in France, with a safety net -- no point in playing the ostrich here: we have little taste for taking risks -- the system could work." That safety net for middle-management candidates for starting a company might be the promise of their jobs back at the parent company if the new venture failed.

As for technical and financial help, there are formulas for getting it already at SNEA. Le Cetre, the technical center for the Aquitaine region, makes its facilities available to local firms. M Francois Bernard, M Delapalme's deputy, explains: "In the 2 years it has been in existence, the track record is already very encouraging. Out of 134 requests for technical help, more than half come from PMI-PME [small and medium industry and business] with fewer than 50 employees."

Another special arrangement to encourage innovation is an ELF subsidiary known as INOVELF, which has already invested some hundred million francs in innovative projects devised by such small and medium companies as Goupil in data processing or France Embryons in biology. ELF even has a brand-new "venture" subsidiary in New York, called Elf-Technologies, Inc.: for the last few months, it has been investing in technologically advanced companies in the United States. "Using the venture-capital approach, we hope to get some financial return, of course," explains M Jean-Francois Saglio, director of innovation and research support. "But what interests us even more is the industrial return."

No. This one of "Delapalme's boys," as he describes himself, a graduate of the School of Mines and a deserter from the Ministry for the Environment, has some very specific -- and not very gentle -- views on French-style venture capital. Because they are over-cautious, the corporations who set up to finance innovation would never, in his view, have allowed Apple to be born. Before you talk about venture capital to stimulate industrial research and development, "The Question," as he says, is this: "Are the French innovators businessmen?" And since the answer is often "no," we need other avenues for financing.

If your name isn't ELF-Aquitaine, when you have neither its organization nor its money, research is still something you have to do. Every business has the same requirements. You have to change, to adapt, to innovate if you are going to stay competitive and survive. Everybody in industry is concerned. "We no longer have cutting-edge sectors on one side, traditional sectors on the other. That notion is completely outdated," says M Maurice Allègre, known as "Mr Industrial Research" at Chevènement's ministry, where he is in charge of DESTI (Scientific and Technological Innovation Development). He continues: "Companies that fail to understand that they must apply the new technologies in their plants will inevitably be left high and dry."

There is no appeal from that verdict, for the big any more than for the small fry.

All the surveys and studies prove that the PMIs, thanks to their ability to move quickly into new markets, seem to have more technological get-up-and-go. Or, maybe, that big conglomerates behave differently. In a cutting-edge sector, their goal is frequently to develop a new manufacturing process, which means that the admission fee in terms of research and development is going to require investment of several hundred million francs over a period of some 5 years. The PMIs, though, given a few million, can develop one step in a process or one product in a single year.

#### Acceptance

Founded in 1979, EPI (Expansion Plastics International) is an incorporated subsidiary of the Limagri Corporation. EPI makes permeable trays and cartons of expanded polystyrene. Limagri markets these products to fruit and vegetable dealers, slaughterhouses, supermarkets, and, above all, to SOCOPA. A small Avignon PMI with 50 people on its payroll, Limagri in 1981 did 12.5 million francs worth of business. Two years ago, it got the idea of mass-producing expanded polystyrene cartons with a metal-coated bottom. Total Investment : 3 million francs. In a short time the new product was enthusiastically accepted, even in foreign markets, where negotiations for licences to manufacture are now going on, and enabled the company to stand up better to its competition. EPI is trying now to diversify into a housing insulation system using expanded polystyrene.

EPI found the financing it needed at Anvar, the National Research Marketing Agency.

To hear Anvar's director for industrial development, M Albert Vartanian, tell it, finding the money isn't the hard part. "Any clever and resourceful man can find it," he thinks. "We have already counted more than 50 sources of financing: little specialized lenders in every sector. In telecommunications, the military, and

in places like the energy management agency, Anvar, and all sorts of special deals (medium-term innovation loans from Inodev, which is the capital loans subsidiary of the PMEs)-- any serious project can find somebody to back it." Supporting evidence: the 700 million or so francs Anvar handed out to 1,800 innovative companies in 1982. Among them, three fourths were PMIs. Despite all this, there are only a bare 1,300 companies engaged in research in France and there ought to be 5,000. Furthermore, the statistics on the whole matter are shaky, to say the least. Just where does industrial research begin, and where does it end?

"We do have a certain tendency to add apples and oranges," notes M Vartanian. "Few companies are making real research efforts. They are merely improving the products they have, and that's all." Research spending in most companies scarcely tops 1.5 percent of their volume of business. That being the case, we must admit that few French industrialists are willing to emulate M Georges Bret, president and general manager of Quantel. He built, sold, delivered, and repaired his first lasers himself, in a little workshop no more than 20 square meters in size. Today, with an annual volume of business of 42 million francs and an American subsidiary that brings in 60 percent of its sales, Quantel is one of the world's leaders in its special field. This onetime professor of quantum physics on the University of Paris faculty does admit -- with some false modesty -- that he is tired of constantly being held up as an example along with a handful of others. "It's flattering, but hardly representative: we are exceptions," M Bret agrees, but he, too, deplores the lack of "entrepreneurial" spirit among the French. "When I hire a Frenchman, he asks me all about company fringe benefits. An American wants to know about stock options. Just look at the names of the great French or foreign corporations: Renault, Dassault, Michelin, Bell, Hewlett-Packard. They all began with real men, builders, creators."

For those who are not potential Brets, nor yet Renaults, their best bet is to rely on imaginative structures. In industrial research, there are some. Not very many-- perhaps a dozen, at most, in all France, but they exist. They are the private research centers that work on contract. The most illustrious among them are Hydro-mécanique and Frottement, Metravib, and, first of all, Bertin, the biggest in Europe, known to the general public through the Aérotrain and the Naviplane. Unlike the professional technical centers, which work for their own particular sectors (wood, leather, or welding), the contract shops, with their respective pools of expertise (friction, vibration, or mechanics in the broad sense) shower all sectors of industry with their ideas. Example: the ink-jet printers developed by Bertin, which are now standard equipment in all the postal sorting centers in France and imprint 2,000 bar-codes per second. The major problem was frequent clogging of the minute orifices through which the ink was expelled. It was solved by applying a technique originally developed for the aircraft industry. One of the team engineers remembered that, in

some turbojets, the fuel is ejected through radial holes drilled in a revolving disc. Owing to centrifugal force, the diameter of the jet is far smaller than the diameter of the hole. With rotating openings that were not so very tiny, you got less clogging and more reliable printers. The hunch paid off.

### Self-Feeding

"Only a background of experience in all directions, exploited in a horizontal structure like ours makes such technology transfers possible," claims M Georges Mortchelles, general manager of Bertin. "From satellites to housing, from nuclear technology to printing, the fabric of industry must feed itself technologically." At Bertin, a team of engineers who provide the interface between research and industry takes care of that. It is no accident that the team is part of the marketing service headed by M Daniel Breford.

It is, if you will, the antithesis of the professional or trade technical centers, so often disparaged, sometimes sclerotic: financed principally through parafiscal taxes, the trade centers are supposed to provide the benefits of their research to all members of the trade. It is hard to see, under these conditions, how they could give one particular company the technological "edge" that might swing a bigger share of the market its way. Industrial secrecy, like noblesse, "oblige."

With the private research contract centers, though, that is altogether possible. In 1968, the Douarnenez Metallurgical Company, a little family-owned PMI, came to see Bertin with a few handmade samples for a new self-opening sardine tin. Specializing in small-size tinplated steel cans, the company was worried about competition from the new manually opened aluminum cans. The meeting with Bertin allowed it to move up to industrial scale. Machines and product units were developed. Can production leaped 50 percent! The investments required made it necessary for SMD to merge with PUK. That was the beginning of the Franpac Company, which today controls 30 percent of the market. While retaining rights to the process for small-size tins, it gave a licence to Carnaud, the French leader in tinplate cans, which now uses the process abroad.

There is always a PMI among Bertin's 20 top customers. The major sources of revenue, though, are ELF, Saint-Gobin, Usinor, SNIAS, and government agencies (the ministries, Anvar). The fact is that a company like Bertin -- 175 million francs worth of business in 1981 -- lives mainly on government contracts.

As a partner in most of the big national programs, it derives most of its financial resources and its technical expertise from them. Its work on Pierrelatte made it knowledgeable in gaseous diffusion, which it then applied to the design of artificial lungs and kidneys, and in ultracentrifuging, which it transplanted to cleaning up oil spills.

## INVENTIONS FROM FARAWAY PLACES

Sectors of Industry	Total Number of Patents Filed	Percent of Foreign Patents
Mineral chemistry	2,381	85
Organic chemistry <sup>(1)</sup>	13,204	90
Pharmaceuticals	12,247	82
Parachemicals <sup>(2)</sup>	6,813	88
Paper	1,237	83
Consumer electronics <sup>(1)</sup>	3,204	82
Data processing	2,709	78
Precision machinery <sup>(1)</sup>	15,511	80
Textiles	5,690	82
Office machinery	175 (in 1978)	83
Robots	95 (in 1978)	78
Metal processing <sup>(1)</sup>	5,268	76
Fuels <sup>(2)</sup>	2,627	79
Electrical equipment <sup>(1)</sup>	15,917	72

(1) Except for the year 1979.

(2) Except for European patents

Source: CES

Who holds these patents? In order, the Americans, the Germans and the Japanese.

What all these sectors have in common is that they are highly capital- and research-intensive, and have high rates of profit. In a word, they are the best.

Such prestigious innovations as the Airbus or the Antope remote data-processing system are one thing. High technologies applied to everyday life are another. They do not turn into the "deal of the century," yet they are the real reflection of the level of scientific and technological advancement in an industry. And an index of its economic health. Without this indirect fallout, the big programs -- whether or not they are trend-setters -- do not beget growth, nor jobs, nor progress. Dear to the heart of our President, that hoped-for triad will materialize only if the programs are right on target.

"There must be a synergy set up between national policy and the needs of industry," M Mortchelles maintains. "An industrialist is ready to pay for adapting new discoveries to his particular problem. He is not willing to pay for making them." That is why, determined not to be left on the sidelines at the rebirth of French research, Hydromechanique et Frottement, Metravib, and Bertin formed an association on 1 February 1982 to get recognition for their profession: industrial research. Tirelessly their directors, Messers Jacques-Jean Caubet, Jacques Martinat, and Georges Mortchelles are carrying the good word from ministry to ministry. Will anybody listen?

No question about it: the time has come for gangways to drop between research and industry, between the public and the private sectors. The CNRS already has a committee on industrial relations, a kind of club where research and industry people can get together and talk. It is fielding a network of regional chiefs of mission to guide the PMIs through the labyrinth of its 1,150 in-house laboratories. The Center for Atomic Studies is also accentuating its availability to industry. And still another successful industrialist, M Yves Sillard, has been named to head Cnexo (the National Center for Ocean Exploitation). On every front there is a concerted effort to translate scientific knowhow into technological knowhow.

Still to be found, though, is a common language. Where an industry type will talk about "uneven air circulation around products to be dried," the scientist will say "flow-modelling in a porous medium in the presence of heat convection." Absent such a lingua franca, shall we have to start training interpreters?

There is no point in fooling ourselves: our trade deficit in manufactured products with the three dominant industrial powers, the United States, Federal Germany, and Japan, is in direct ratio with the number of patents filed by each of these countries. The leaders in technology are also the leaders on the world's markets.

Industry Minister Interviewed

Paris LE NOUVEL ECONOMISTE in French 5 Jul 82 p 45

/Interview with Jean-Pierre Chevenement, minister of industry, by LE NOUVEL ECONOMISTE: "France will Be No 3 in Technology by the year 2000" /

A third of the products that will be on the market 5 years from now do not yet exist. This is the idea M Jean-Pierre Chevenement plans to use to convince French industrialists that their competitive position tomorrow depends on their research effort today.

[Question] In these times of budgetary austerity, how do you hope to achieve your goal of earmarking 2.5 of the GIP for research in 1985?

[Answer] The mere fact that we are experiencing a recession right now does not mean that we must cut back on our research effort. Quite the contrary. That civil research budget (25.4 billion francs, a thirtieth of the total state budget, one half the total research budget, which also includes military research, university research, and research financed by the Postal and Telecommunications Ministry) is going to bring the 17.8-percent annual growth in volume called for under the planning act for the years 1983, 1984, and 1985.

The 1985 research budget will thus come to better than 41 billion 1982 francs. But, above and beyond the government effort, passage of the orientation and planning act will permanently mould habits and behavior patterns. In less than a year, we have given ourselves a strategy and a legislative arsenal scaled to the effort that will make France the world's third-ranking scientific and technological power by the year 2000.

[Question] Just how can you increase the industrial research effort by 8 percent in volume each year?

[Answer] It is up to the corporations to anticipate and understand the nature of the technological challenges they will have to deal with. A third of the products that will be on the market 5 years from now don't even exist yet. Technology is a vital component in competitiveness.

Of course, we are determined to encourage the shift. Through credit. Through tax incentives. We are already discussing one incentive measure with M Fabius.

I will also be watching to make sure that the staff people here at the Research and Technology Ministry bring a little leverage to play on what individual companies plan to do. All nationally

owned corporations will be getting firm directives telling them to bring the private sector into the picture on their progress -- especially their subcontractors. There are not nearly enough French companies doing research activity. Our industrial research will have to catch up with Germany and Japan.

[Question] Do you really feel that the innovation finance agency has sufficient clout?

[Answer] Besides the Anvar staff, we have to mobilize the whole banking system. That is the assigned role for Inodev, which will shortly be expanding its capital. We are aiming at two objectives:

\* By lowering the medium-term interest rate to 15.5 percent, we shall be offering all the banks a finance package that will be attractive to industrial customers: the rate at which Inodev is getting applications right now proves that.

\* Furthermore, we hope that Inodev will help, by granting participatory loans, to revitalize the budgets of innovative companies.

Finally, it is absolutely indispensable for the government to encourage the growth of small, high-technology firms based on the ideas of one man, or a small team, but requiring considerable financing to get started. The innovation financing agencies and the regional development agencies invest no more in this kind of undertaking than about 150 million francs a year. We are working now with the Ministry for the Economy and Finance on setting up some joint funds for limited-term loan placement.

[Question] The main criticism aimed at your policy by industry circles has to do with this decision to set up mobilization programs, which they call both too trendy and too vague.

[Answer] The mobilization programs -- seven of them -- are an essential innovation in law. They will enable us to plan and to pool efforts in a whole array of clearly defined "national projects," which will be able to transform themselves legally into the new "public interest groups" with their own objectives and adequate financial means keyed to their timetables.

The partners in these undertakings will be brought into their design and the follow-up on it. We must make sure they can handle key technologies (such as manufacturing integrated circuitry in electronics, for example), develop basic research (such as microbiology for the biotechnologies), or significantly transform working conditions, cooperate at the scientific level with developing countries, and spread scientific learning. Finally, there is a program for technological development of the fabric of industry, which was designed specifically to start technological research and development on key techniques which concern all of industry.

[Question] A lot of people say that you have a "Gaullist" view of France's scientific and technological independence. How do you reconcile that view with your determination to open up to the international market?

[Answer] General de Gaulle developed the cutting-edge sectors involved in defense (nuclear, weaponry, aviation, space). Today, the technological challenge is everywhere. The "arsenal" strategy is no longer adequate. We must at one and the same time keep the world market in our sights and loosen the outside constraint. France's place in the world, in what is sometimes called the international distribution of labor, will in fact increasingly reflect her place in the international distribution of knowledge.

Starting with the development of new technologies, the goal is at once to recapture the domestic market and to increase our shares of the world market. But none of this will be possible at all without the political will to do it, and without popular support.

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SCIENCE POLICY

BRIEFS

ASSOCIATION FOR SCIENTIFIC EXCHANGE--The Association for the Development of Scientific and Technical Exchanges between France and Japan (ADEFJAST) has publicly announced its recent formation. Founded "at the initiative of research people, university faculty, and those in charge of scientific and technical matters in French industry, in both the public and private sectors, who are engaged in long-term professional activities with Japan," ADEFJAST is headed by M Jacques Ruffie, member of the Academy of Medicine and professor of the Collège de France. ADEFJAST's board of directors lets it be known that it will allow itself a year to "examine the feasibility of a Franco-Japanese association for sciences and technologies, which assumes, among other things, setting up a corresponding Japanese branch," and to "do some consciousness-raising among small and medium enterprise circles." The association's bureau will publish a scientific and technical newsletter on Japan for its members. [Text] [Paris LES ECHOS in French 13 Jul 82 p 6] 6182

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## TRANSPORTATION

### FRG DEVELOPS SAIL-POWERED CARGO SHIP FOR INDONESIA

Hamburg DER SPIEGEL in German 26 Jul 82 pp 56-57

[Text] Do sailing ships have a new future as freighters? An energy-saving cargo carrier has been developed in Hamburg.

For windjammer enthusiasts the sail-powered freighter, which was darting about as a 1:9 scale model on the Ploener See in Holstein on its maiden voyage for test purposes, was a disappointment.

The "Indosail" project has neither the majestic bearing of a "queen of the seas," which "is flying along under the cloud of her sails"--as the Australian sailing writer Alan Villiers writes enthusiastically of the legendary clipper, the "Cutty Sark" (built in 1896).

The ship, designed in the Hamburg Experimental Institute for Shipbuilding, does not come close to the "most magnificent in the endless list of sailing ships ever"--which is the judgment of the German biographer of the great sailing ships, Horst Hamecher, on the "Preussen" (built in 1902). The five-master, with its 8,000 tons capacity, was the biggest and fastest square-rigger of all time.

Compared with such beauties of the sea, the tub which was developed with budget funds from the Ministry for Research for the island state of Indonesia, is ugly.

Optically the hull is dominated by a squat deckhouse on the stern for the crew's accommodation and the bridge. The harmony of the sails in the modified gaff rig is broken by the huge rectangular mainsail--a concession to the results of wind tunnel tests, which gave the best figures for this cut, and to the plans for full mechanization of sailing ship operation.

With the aid of electric motors or a hydraulic system, the sails are to be set, taken in and reefed--reduced in size--in high winds in less than 1 minute, by one man if necessary. The principle used was borrowed from modern yachting: At the back of each mast there are vertical rotating tubes on which the sails can be rolled in and out, like curtains on the roller of a blind.

The difference about "Indosail," the abbreviation for a program called "Development of Sail-Powered Freighters for Indonesian Island Traffic," is: Of all the projects

that have been thought up since the explosion of oil prices to revive freight shipping under sail, the Hamburg-Indonesian project is probably the closest to becoming reality.



#### Indosail Model: Competitive Today

The 25-meter long hull for a test ship following the "Indosail" design is already under construction in Indonesia. In 1 or 2 years the prototype of a series of sail-powered freighters is scheduled for launching. It will be of 2,000 tons, about 65 feet long and, unlike the 5-meter long model and the test ship, be fitted with three or four masts instead of two. Ships of this type are thought of as replacements for coastal motor ships of about the same size which have been used until now in island trade in the Indonesian archipelago.

The large number of crew required in proportion to the load capacity, the unavoidable, often extremely hazardous back-breaking work of the crew members among the masts and spars, clumsiness in maneuvering, but most of all the lack of punctuality determined by the wind, caused the great freight-carrying sailing ships to lose the contest with the steamer and later the motor ship.

Certainly many clipper ships, with their broad spreading spars and angular hulls, which were considered to be the peak of the art of building wooden ships, or sailing giants like the "Preussen"--which was lost in 1910 following a collision with a

steamer which had underestimated her speed--over short distances and under favorable wind and sea conditions, could have left behind even an average modern freighter, capable of 16 knots.\*

But over the long term and viewed over several trips, even the "Preussen" and other steel-hulled "Flying-P-Liners" of the Laeisz Shipping Company in Hamburg--such as the "Passat," which is now tied up in Travemuende as a floating monument or the "Padua" which is today the schoolship "Kruzenstern," flying the Soviet flag--managed only a maximum of half the speed of an average modern freighter.

Their captains would not have been able to guarantee times of arrival calculated precisely to the day, even to the hour, as is usual today on the regular routes, even taking long-term average figures into account--because the wind and the weather were not always predictable, even for the most experienced seamen.

However, in the meantime speed is no longer everything for the shipowners. In 1970 1 ton of heavy oil for a ship's diesel cost about \$ 16. Today it is traded for about \$360. The share of energy costs in the total operating costs of a freighter increased in this time from about 10 percent to as much as 40 percent.

Today newly built freighters, the so-called multipurpose freighters, are equipped with engines which are designed for a speed of 14 knots, compared with 16 knots just a few years ago--30 percent less power is required.

Owners of container ships, the fastest freighters, had entire engine installations removed: The container giants of the "Tokyo-Express" class, owned by Hapag-Lloyd, which previously had two engines, each of 40,500 hp, and were capable of 27 knots now have only one engine and can reach only 23 knots.

It was not only the price of oil that weighed increasingly in favor of a return to free energy in maritime transportation traffic: Through the use of materials and technologies that were unknown to our ancestors, ship operation could be adapted to sail-powered freighters more efficiently. The findings of aerodynamics make it possible to provide an optimal shape for the propulsion unit, that is to say, the sails. As a result of the long-term weather forecasts that are possible with the help of satellites and the course that is selected with this in mind, the captains of sail-powered freighters could largely eliminate the imponderables of wind and weather, and since the mid-1970's an entire army of patient inventors and dreamers, engineers and oldtimers from the industry, who cannot forget the faded memory of majestic ships, has been planning the renaissance of the windjammers.

Windmill ships were designed, which could even sail against the wind, even if it was only in a light breeze. Ships with vertical rotors were put down on paper, in which the wind was initially to generate electricity which then powered the ship's engine.

Licensees, among them some in the United States, are experimenting with the "Dyna-Ship," which was created in the 1960's by the Hamburg engineer Wilhelm Proells and which is still considered by the experts to be one of the most promising projects:

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One knot: 1 nautical mile (1. 852 km) in an hour.

Piöells designed a wind-powered bulk freighter, with a capacity of 17,000 tons, and whose enormous sail area of 9,600 square meters ("Preussen": 5,500) is carried by six rotatable masts of elliptical cross-section. By computer simulation the ship has been commuting on paper for 1 year across the north Atlantic from Hamburg, it achieved a respectable average speed of 11 knots--equipped with an auxiliary engine for calms. The costs per ton carried were about one-third less than with a comparable motor ship.

Nostalgia overwhelmed the originators of dozens of other projects in their thinking. The Hamburg captain and Elbe pilot Wolfhart Schoenfeldt, who recently revealed his idea of a 12,000-ton capacity five-master, makes concessions to technical progress: auxiliary power for crossing areas of calm, the use of weight-saving and weight-savings ingredients and remote control of sails from the console on the bridge.

But his ship, like most of the legendary Flying-P liners, is rigged in the traditional manner as a so-called bark. "When it sails by Blankenese on the Elbe," Schoenfeldt says, "no ferryman will notice that it is not a Laeisz sailship."

Ferryman Schoenfeldt, who once learned his trade on the four-masted bark "Padua," is thinking of something beyond this: "Because a ship like this would be unique" there would certainly be enough people wanting to travel as passengers for a great deal of money, and this could help to meet the cost of the crew's wages.

The technicians and inventors have not been able to prove together whether the calculation works out in practice.

There are already a few freighters sailing the seas, using the wind as an auxiliary force to support engine propulsion. For example, the 700-ton Japanese motor tanker "Shin Aitoku Maru," which carries on its deck two rigid aerodynamic sails which can be folded up when not in use or when the wind is too strong, and which are rotated into the best position for each situation by a computer. However, of the approximately 40-percent energy savings which the tanker achieves in comparison with a traditional ship of about the same size, only 5 percent come from the wind as an auxiliary source of power. The rest was achieved through other refinements in ship construction.

Or the Greek coastal motor ship "Mini-Lace," which has been operating since last year with an electronically controlled auxiliary sail on a freestanding mast on the bow and helps to save energy costs for the shipowner.

But no shipowners are taking on the risk of putting a genuine "wind ship" in service --with an auxiliary engine for emergencies and maneuvering in harbor--as a freighter, and even the German shipowners, according to the Association of German Shipowners, are adopting a "fairly wait-and-see attitude" to similar projects.

It could happen that this will change with additional increases in oil prices. In many areas of shipping, for example in bulk freight transport, average speeds will probably have to be reduced, and--according to Peter Schenzle, engineer at the Hamburg Experimental Institute of Shipbuilding and project head of "Indosail"--"they will approach those which can be achieved with sails, applying today's aerodynamic findings."

"Indosail" is no racehorse either. Based on the average prevailing wind force of 3 in its area of operation, the 2,000-ton prototype will reach an average speed of 6 knots--1 knot more than a traditionally rigged ship of a similar size, for example, the bark "Gorch Fock," the school ship for the Bundesmarine, would achieve under the same wind conditions.

But unlike transoceanic trade between fast ports, in which freighters can be handled within hours after long trips, sail-powered freighters in the Indonesian island trade are already competitive today with average speeds like this. The distances between the many anchorages in Indonesia are short, but by comparison the layover times in the harbors, which are usually only equipped with cranes, are relatively long.

And then it is not worth mentioning if a sailship ties up a few hours later because of an unexpected calm.

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## TRANSPORTATION

### PEUGEOT, RENAULT CONTINUE AUTOMATION IN MANUFACTURING

Paris INDUSTRIES & TECHNIQUES in French 10 Jun 82 p 14

[Article by Alain Perez]

[Text] Welding, painting, and loading will soon be fully robotized; the next step: assembly.

Six-axis robots at Peugeot, flexible shop at Renault: the French automakers are placing all their bets on the automation card. Since 1978, PSA has discreetly been building itself an impressive robotized production facility. At Sochaux, some thirty hydraulic six-axis Unimates with capacities of 15-40 kg are in service on two parallel welding lines. They work on the assembly of 305- and 505-model bodies. Breakdowns occur less than 10 percent of the time, of which only 1 percent is attributable to the robots. This is fundamentally due to the welding heads.

#### 1.10 Minutes Per Body

These robots are designed to spot weld eight different models. Four programs are presently used (305, 505 sedans, station wagon, and the United States version). The bodies are identified by a photoelectric cell at the head of the line, which detects the length of the frame. Each robot performs between 300 and 350 spot welds. The average time per body is 1.10 minutes.

About 50 six-axis, 80 kg robots (800,000 francs each) have just been ordered from Acma Cribier, a Renault subsidiary. They should be delivered before the end of the year. For 90 percent of the time they will also be used for welding tasks, a function which thus should be fully automated in two to three years.

According to the company's forecasts, in five years the Peugeot inventory will include 250 six-axis robots, compared to 140 at the end of 1982 (including the 50 Acma). Sequential or programmable manipulators will remain stable: 6500 compared to 6000 at present. The latter will be essentially used for loading and unloading machines, and especially presses. Multi-task robots are the rule in foundries, and there again, six-axis machines are necessary. They perform seven sequential operations in the fabrication of gear box cases: extraction from the press, mechanical control, water bath cooling, breakage of molding runners, emptying the water trapped during turnaround, and removal. Here again, hydraulic Unimates are

doing the work. Production increase is of the order of 10 percent over the manual approach: 1092 parts per day compared to 942. On the other hand, breakdowns are more frequent in the automatic mode: 16 percent compared to 10 percent. Apparently man stands up to heat better than the robot, a performance which he would probably willingly give up.

The learning-mode six-axis machines are essential for welding (complex paths), but the situation is less clear for body protection operations. At the Mulhouse plant, two five-axis electric Trallfa robots have been in service since three months. They are used to spray undercoating in the 104-model wheel wells. For painting, however, the company uses simple sweep robots (two orthogonal translations) manufactured by Ransburg. A six-axis AIP is being tested for this application, but according to Peugeot specialists, five axes are sufficient.

Because of all this automation, the stock of bodies has changed from 20 days to five. The goal is to limit all that is not "net work," which means transportation, storage, and mounting on machines.

How far can we go? The answer comes from Mr Malcuit, director of production at Automobiles Peugeot: "For us, the only impediment to automation is our investment capability." In other words, if the means were available, all welding operations and all handling would be automation. That is, until final assembly, where the technology has not yet been fully perfected. The ideal is the famous Japanese concept, "zero breakdown, zero defects, zero stock." It remains to be seen if this will occur through "zero personnel."

At Renault Véhicules Industriels, the flexible shop of Boutheon is humming. There is no question that Regie Renault achieved a true technical victory, practically on schedule (several months of delay). In this highly automated shop (parts transfer, programmed machining), only the loading and clamping of rough parts, as well as turn around, are manual. A central computer makes a decision every 18 seconds. It controls the operation of the whole, and establishes priorities depending on circumstances. The task is to manage in real time a considerable number of events (3-4 per second). Any change in status (free machine, start or stop of one of eight wire-guided carriages, crossing conflict) is considered as an event. In practice, the number of families of parts to be fabricated during the day is decided in the morning at the beginning of the shift. The shop is self-regulating, which brings us closer to the "zero" concept. The inter-operation stock is null by definition, possible breakdowns are taken into account by the program, and quality is controlled partly on the machines and by sampling. As for personnel, it is reduced to five-man teams for a production of 100 assemblies per day (currently on the order of 30), or 300 parts.

The only open question is the profitability of the whole. The utilization index of the machines is multiplied by a factor which is still rather mysterious. The shop costs on the order of 45 million francs, plus study expenses which are at least as much of a mystery. There is no doubt about it: automation is becoming an industrial reality, and each one has his own way of counting.

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## TRANSPORTATION

### NC PROCESSING CENTER FOR SANDWICH-CONSTRUCTION AIRBUS PARTS

Munich-Ottobrunn MBB AKTUELL in German May 82 p 1

[Text] They are taller than a man, as light as a feather and yet so rigid that fire extinguishers and complete toilet cabinets can be attached to them: The sandwich-construction dividing wall in the interior fittings of the Airbus. MBB [Messerschmitt-Boelkow-Blohm] in Hamburg will be able to react much more flexibly to customers' wishes in the future when finishing the interior and still save about three-quarters of the man-hours required previously. This will be made possible by a new processing center for sandwich sheets which Fittings Technology and Manufacturing recently opened in the Hamburg factory.

The sandwich sheet is one of the most basic design elements in the manufacture of aircraft interior fittings. A "sandwich" consists of two outer layers with fiber-glass reinforced plastic which enclose a paper honeycomb of a particular rigidity. These elements are used, for example, as dividing walls in the on-board toilets, in cargo holds or as facings in the cockpit. Since each of the more than 40 airline customers of Airbus Industrie receives individual interior fittings that match its image, the sandwich parts used are also customer-dependent to a large degree. They differ not only in the pattern pressed into them but also in their shape.

There is an additional important aspect for the plastics workshop in Hamburg to consider: Depending on the airline, up to 150 drilled holes per component are needed for the sandwich walls, which differ each time in number and position. After drilling, inserts (different threaded plugs for supports) are put in the holes. Previously these operations could only be carried out using a large number of complicated and relatively clumsy templates. Each one of these templates had an average of 20 variations, from which the required combination had to be selected.

These assignments can now be carried out more flexibly, more safely and about four times faster with the aid of an NC-controlled processing center. The machine's job is to drill blind holes and through holes in sandwich sheets and then put the threaded inserts into the holes and glue them automatically. It is also suitable for contour shaping of components made of fiberglass reinforced plastic.

The most important advantages of the new processing center are:

--Fittings technology can react flexibly to requirements in Airbus interior fittings that are set at short notice and carry out customers' wishes.

--Man-hours for manufacturing per aircraft is reduced to one-quarter of the amount, compared with the time spent previously.

--Accuracy can be increased at the same time and consistent quality can be guaranteed.

--Bulky and heavy drilling equipment is largely dispensed with. This allows the area that was previously used for storing templates to be used directly for manufacturing.

The processing center itself is a special development, which was designed and built (with partial support from the BMFT [Ministry for Research and Technology]) specially for the complicated assignments in the assembly of Airbus interior fittings. The dimensions of the machine, including the control panel, are 7 ms by 3.6 ms. The holding surface of the machine table measures 2,200 mm by 2,400 mm. It is equipped with several vacuum locating fixtures which are automatically pressure-activated as each piece is laid on them and holds them securely at a pressure of 0.7 bar. The NC sheet drilling machine puts the threaded inserts into the blind holes after drilling and, through a filling station, also automatically squeezes the precise amount of adhesive into the adhesive holes of the inserts. The inserts are kept in magazines and can be summoned according to type. The processing center can be controlled by manual input or by punched tape.

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TRANSPORTATION

BRIEFS

TRANSRAPID SUSPENSION DEVICE TESTED--At the end of March a significant milestone in the current magnetic rail program was reached at MBB [Messerschmitt-Boelkow-Blohm]: the first fully equipped suspension truck for the Transrapid 06 achieved "magnetic" levitation for the first time without any problems on the MBB test stand in Garching. MBB, which is directing the project, is responsible within the Transrapid magnetic rail consortium not only for project management but also for important system components like the transportation and guidance system. The vehicle, which is now under construction at Krauss-Maffei, will be equipped during the course of the year with a total of eight suspension trucks, which have been fitted and pretested at MBB. The start of operation for the Transrapid test facility in Emsland is scheduled for 1983. [Text] [Munich-Ottobrunn MBB AKTUELL in German May 82 p 1] 9581

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